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ABSTRACT

This investigation chronicled the experiences of an instructor and her students as they first experienced a distance course that utilized various technologies. Both the instructor and the students had limited or no experience with e-mail, use of the Internet, or the supporting software. The students were 33 elementary school teachers taking a graduate level science education course at Morehead State University. The challenge was to utilize the technology without reducing course content. Each class had to be well planned and organized, especially since the instructor had students participate in hands-on elementary science activities. There were fewer impromptu discussions and the instructor felt it took longer to do things by distance learning. Students were generally pleased with their experiences, citing such reasons as accessibility of courses previously unavailable, the opportunity to learn new technologies, the opportunity to share and learn from students at different locations, and the feeling of being more actively involved in their own learning. Problems encountered included technology problems, particularly sound quality; time wasted while setting up student presentations; and less teacher contact. The number of students expressing concern about the amount of teacher-student contact declined as the semester progressed. Students who used e-mail to send assignments and correspond with the instructor indicated that they felt they had more interaction and feedback on assignments than in traditional classes. (PVD)

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Looking at Distance Learning Through Both Ends of the Camera

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Paper presented at the annual meeting of the National Association of Researchers in Science Teaching, San Diego. April 21, 1998.

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Looking at Distance Learning Through Both Ends of the Camera

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> I find distance learning to be both fascinating and aggravating. I have enjoyed learning how to use the equipment and learning how to use Powerpoint. Distance learning is also a great way to share ideas with a larger group of educators than would be possible in a single classroom setting.
>
> I find it aggravating at times...due to technical difficulties.
>
> Jacqueline[1], a distance learning student.

As this quote from a distance learning student states, the distance learning experience can be mixture of both positive and negative experiences. Learning from a distance--compressed video, internet connections, and other communication technologies-- has found a place within education. This study has endeavored to create a picture of the distance learning experience from both the perspective of a first time instructor and the students enrolled in a graduate level science education course.

A number of investigations evaluating televised instruction in terms of student performance are common (Delbeq and Scates, 1989; DeLoughry, 1988; Moore and Thompson, 1990; Souder, 1993; Stone, 1987, 1988). In general the findings of this research indicate that students taking televised courses at remote sites perform as well as their counterparts taught in traditional classrooms (Cohen, Ebeling, and Kulik, 1981; Moore and Thompson, 1990; U. S. Congress, 1989; Wetzel, Radtke, and Stern, 1994). Most of the research on distance education provides "snap-shot" profiles of student content learning and/or student attitudes. Studies which extend over the duration of a course are minimal. Both cross-sectional and longitudinal assessments of student participants and distance education programs are necessary to evaluate the effectiveness of programs and to provide guidance for future development (Westbrook, 1997; Biner, 1993; Simonson, Schlosseer, and Anderson 1993; Sachs, 1993; Eagen, et al., 1992). Also, in comparison with other distance learning topics, the degree of student satisfaction with education at remote sites has been neglected by researchers (Biner, 1993). On-going assessment of distant learner satisfaction can have far-reaching benefits--lower attrition rates, increased student motivation, increased student-generated referrals, and enhanced learning (Biner, Dean and Melliger, 1994).

Background of the Study

Distance Education at Morehead State University, which operates via a fiber optic telecommunications system, has grown from one class delivered to seven sites, Fall semester 1995, to more than 29 classes delivered to eighteen sites, involving more than twenty-three

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[1]Pseudonyms have been used for the names of all participants.

faculty members and six hundred twenty-two students. The university utilizes a fully interactive telecommunications system that provides full motion video (compressed) and audio transmission. On-campus and off-campus students interact using either a voice activated microphone or a push-to-talk microphone[2]. The instructor aided by a site facilitator at the origination site controls the delivery of course content and communication among sites by using a touch-controlled computer panel. All sites employ a site facilitator who operates the technology, acts as a liaison between the students at the remote site and university faculty, and performs class management duties, such as taking attendance, distributing materials, and proctoring quizzes and tests. The instructor also makes periodic visits to each remote site and transmits classes in order to establish personal contact with the students. Technologies present at each site include teacher and student cameras[3], a computer located at the podium for the use of the instructor, student computers, an overhead camera for display of class materials (which will also transmit the image on the podium's computer), and a minimum of two monitors (one monitor displays the image currently being transmitted and the other monitor always shows one of the remote sites). All classes transmitted are also video-taped at each site. Students may access these tapes to make up for absences.

Purpose of the Study

The primary goal of this investigation was to chronicle the experiences of an instructor and her students as they first experience a course delivered at a distance utilizing various technologies. Both the instructor and students had no or very limited experience with e-mail, use of the internet, and the supporting software. The challenge was to learn and utilize the technology without a reduction in course content.

According to Bullough, Knowles and Crow (1992) and Yin (1989) case studies are valuable when investigating situations where the researcher has little control in real-life situations. This method enables the researcher to preserve the integrity of the subjects' experiences and meanings, as well as encouraging sensitivity to changes within the context of the experience without being narrowly bound to preconceived courses of experimentation.

Methods

Subjects. The instructor, Dr. Kern, is an Assistant Professor of Science who has been with Morehead State University for 2 years. Her teaching responsibilities include teaching undergraduate physical and geoscience courses, as well as pre-service and graduate level science teacher education courses.

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[2] Some sites are owned, operated and maintained by the local school districts, which accounts for equipment differences.

[3] The number vary with each site with a minimum of two.

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Looking at Distance Learning

The students are 33 elementary school teachers taking a graduate level science education course, Science 690 Advanced Science for the Elementary Teacher. This course is a requirement for the Masters' Degree and the Fifth Year Program (Teachers must complete one of these programs to maintain certification in Kentucky.)

The Site. Morehead State University is a regional university that services the Appalachian region of Eastern Kentucky. Much of this region is inaccessible to major population centers. The lack of major highways and weather conditions in the region cause the area to remain isolated. The Science 690 students are distributed among five sites--main campus and four public schools in rural Eastern Kentucky.

Data Sources. Data was gathered from the instructor and student journal entries, videotapes of televised classes, and student surveys given at three different times --after the first 3 weeks of class, at the midpoint of the semester, and at the end of the semester.

Results and Discussion

Launching the new semester. The following entry from the instructor's journal following the first class speak of her reservations prior to the class, her first encounter with a *real* distance learning class and her feeling about the class afterwards.

> January 21
> Tonight is the night before my first distance learning class. Although I am a little nervous--I have only been in front of the camera for 5 minutes at a time in training. I'm excited about it and see a lot of possibilities. There are real advantages. The internet and computer applications, that cannot be shown in a regular classroom, can be brought up on camera. I am a little worried about the 2 sites that do not have site facilitators as yet. I sent out materials to each site but I didn't receive any word back from the sites. I wish we had a site facilitators meeting before the first class. (Note: A site facilitator-faculty meeting is scheduled each week).
>
> January 22
> Today came and went. I was more nervous than I thought I would be. I went to class early to try my computer disk--all worked fine. But some of the points were hard to read, so I had to go back and bold the print. When I went back over at the beginning of class... guess what? The computer wouldn't read the disk. I had the site facilitators delay for the first 5 minutes while I made another disk (good thing I had it on my hard drive). An important lesson learned--always have 2 back-up disks.

> Afterwards, I felt good about the class but I felt removed from my students. Unless I call on a specific site there is no feedback or response. I felt so alone and the equipment makes a physical barrier between myself and the students in the room.
>
> For next week
>
> 1. I need to make it clear that they (each site) speak up if there are any problems at all.
> 2. I need to look more out(at the students and camera) and not down.
> 3. and I need to move out from behind the podium.

At the beginning of the course the students expressed appreciation for the opportunity to take Science 690 at a location within driving distance to their home and schools. Many stated that if the course had not been offered through distance learning, they would have been unable to take the course. Although some students were apprehensive about using computers approximately one-third of the class was excited about the opportunity to learn and use the new technologies. Most students were reluctant to speak on camera and remarked in their journals that they were uncomfortable "being on camera." The following journal entry illustrates some students' discomfort with this class.

> ...when I sat in on my first class, I was a nervous wreck. I didn't realize how camera shy I really was. The whole time during our first meeting I kept saying to myself, "I'm never sitting in the front row again." I felt really uncomfortable with the idea that I was on television, and that all the other sites could see me. By our second class meeting, I had changed seats and was much more at ease with the class.

Teaching a course via distance learning requires a high degree of organization on the part of the instructor, constant communication with the site facilitators, many hours of work putting together class presentations and activities, and a real effort to know the students. Typical planning for one distance learning class involves: first, planning the class at least one week in advance and making up packets for each site; second, making arrangements to have the materials sent to each site; third, contacting each site facilitator and discussing the next class; and fourth, planning a alternate activity in the event of technical failure and making back-up disks and "hard" copies of all presentations.

Visits to the remote sites. In addition to the planning mentioned in the previous section, the instructor needs to determine the availability of equipment and the compatibility of computer programs when broadcasting from a remote site. Sometimes the information provided is inaccurate as evidenced in the following vignette.

When Dr. Kern arrived at Ferguson Middle School to broadcast her first class from that remote site, she found Ralph, the site facilitator, huddled with the district technology director and the assistant principal. They were trying to focus in the screen of a laptop computer on the document camera. Ralph had previously told Dr. Kern that they could use Powerpoint presentations at this site. But the problem was that they did not have a computer connected to the podium. Therefore, the presentation could not be broadcast. Their solution to the problem was to try to focus the document camera on the laptop screen. Although the laptop could read the presentation, picture quality was poor. (Compressed video causes picture quality to be "fuzzy".)

Dr. Kern abandoned the computer presentation and the class proceeded on time with Dr. Kern using markers and a large tablet under the document camera. The students also "picked up the slack" with their discussions from each site.

Ferguson Middle School and most of the distance learning sites located in the public schools are new. The site facilitators (employees of the school district) are often inexperienced, but try to meet the needs of both faculty and students. The university works with the schools to train the site facilitators. But at the beginning of the semester these individuals are often struggling with the technology.

The journal entry recounting a visit and class transmission from another remote site paints a picture of an improved situation.

2-19
Tonight I transmitted from Royce. Doug, the site facilitator is very knowledgeable. ....and this group of teachers is really a fun group. They send out for dinner each class at the break. They acted like they were really glad to see me and they told me how important (they felt) it was that they could really meet me. They were really eager to share so much about themselves, and they related stories of how they worried that if they made a remark over the video it would be taken wrong (e.g., one girl corrected me when I called her name --because she goes by another name than what is on her registration. Class seemed to go well. The Powerpoint was up and running fine... but to use it Doug had to disconnect the document camera. So when we hooked it back up, the monitor that I could see from the podium was not hooked up. Someone had to tell me when the paper was positioned correctly under the elmo (document camera). The only other problem was that we were still battling sound problems. Because their cameras are linked to the mikes, they don't use the mute. I was so used to the mute that I used it while we were doing an activity. and so we were muted when we tried to return to air time. So...needless to say when we came back on line no one could hear me. It took us several minutes to discover the problem because they never use the mute.

> The students gave presentations tonight--group presentations. They were really great!! Each one did more than I asked for. They also said that they had a new respect for what I did after they had to manipulate the technology. I could see that some were a little nervous but I think they feel more at ease with it now.-
> At least I hope so....

Traveling to the various remote sites is time consuming and expensive but Dr. Kern stated that after her visits the students were more willing to "come on camera" to ask questions or to participate in discussions. The students also increased e-mail "conversations" with her. The students also expressed an appreciation for the visits. Often they treated Dr. Kern visit as a special day by having a buffet set up in an adjoining classroom or ordering a special treat from a local restaurant.

> Because of the smaller groups a professor's visit can be more of a personal getting acquainted time, as opposed to a large class on campus

The return to campus. Being on the road had its effects on the campus class, as evidenced by Dr. Kern's journal entry when she returned.

> March 12th I was back at Morehead. I felt that much of the good rapport I had established was beginning to erode. They now felt like a new class. That is a downside. I've always had a good relationship with the class. The ones that I communicate with on e-mail still seemed close but those who won't do it, seem removed. In the future e-mail will be required. If they can't do it, then they don't take the class. But I wanted so much for the class to succeed that I gave them several options. The ones that rely on faxes I have a harder time giving feedback.

Mid-semester. After the first half of the semester Dr. Kern related that the hardest part of the class was the feeling of isolation. Although she had a group of students in the room, the equipment (document camera, control panel, monitors) was a barrier between her and the students. As she became more familiar and at ease with the technology she made a real effort to use the portable microphone and move around the room. This was possible because the site facilitator could manipulate the cameras and the control panel. At some of the remote sites this was not possible. Also it was difficult to perceive how the class was proceeding at each of the remote sites. The sites are voice activated. If everyone is quiet the site is not seen (only the last site to speak is seen on the monitor). Some students also felt isolated from the instructor and other class members.

> I don't think you know me as well as you would have had we been in a traditional setting.

> I enjoy getting to know everyone in class and have not been able to do so through distance learning. I believe I have missed an opportunity to meet several new friends and share many other science experiences.

Each class had to be well planned and organized, especially since she was having the students participate in *hands-on* elementary science activities. There were less impromptu discussions in the distance learning class and Dr. Kern felt that it took longer to "do things " by distance learning. The additional wait time between questions and answers was a consideration. She had to make a real effort to wait for responses (because of transmission time). This fact was evident when a humorous remark was made. She had moved on to another topic when laughter was heard from a remote site. Also when the class time expired, transmission ended. Therefore, the instructor had to watch the clock and be sure that she ended on time.

Student presentations. Manipulation of the cameras and microphones was an added challenge when the students made group presentations of thematic units and individual presentations of lessons.

> We started the presentation of individual lessons. I had to be on my toes at all times watching the monitor and making sure that what we were doing was going out to the other sites. Putting samples of handouts under the document camera; having a group of students work under the document camera; and making sure no water or other materials come close to any of the equipment is a real challenge. I found it exhausting. They (the presentations) don't quite have the impact as if you (the students at the remote sites) were actively participating.

Despite Dr. Kern's reservations several students indicated that the presentations were a valuable part of the class and worth the extra effort.

> I have picked up a number of ideas from my peers at Centerburg, and from the students at other sites through our presentations.

Student involvement. Dr. Kern strived to have a distance learning class as close to her traditional Science 690 class as possible. She began and ended each class with a *hands-on* science activity and involved the students in class discussions and cooperative learning strategies such as *jigsaw.* In order to achieve the desired outcome extra organization and planning was needed. Special arrangements had to be made to send materials to remote sites, students had to bring in materials, and extra planning and organization of activities and materials was needed (e.g., water, liquids and particles had to be kept away from the equipment.) Dr. Kern learned by trial and error. Some early attempts were disappointing and the more vocal students expressed displeasure that their classmates were reluctant to participate.

> ...having a camera on you at all times inhibits the discussions and causes only a few students to participate.

> ...some people are a little backwards at the beginning of a class and do not talk much. For those people the thought of having so many other locations on line at the same time just makes matters worse for them and leaves us, who do not care to talk, doing all the talking.

For other sites student participation was less of a problem and the initiation and management of student activities and discussions improved with time.

> We also did more cooperative learning. Having the students in groups with each having a role works well --director, recorder, and spokesperson. We rotate roles. Before I assigned roles students who participated voiced displeasure that other members of their group would not speak in front of the camera. They are happier when all participate.

Student satisfaction. Student satisfaction with the class was closely related to the number of students at each site. Students attending sites with three and four students stated that they had established a close working relationship with the other students at their site.

> This class allows for a lot of cooperative learning. We at the sites depend on ourselves and each other. This is a student directed class not a teacher directed one, and we are suppose to be doing that with our own classes. I know that there are only four of us at Royce but I feel that we are closer than any of my other classes.

> I personally like the small class size because it is not as intimidating as large classes. When I'm giving a presentation I only see 6 or 7 peers, not 30 or so.

A student on campus (8 students at the site) reported that most of his classes contain 25 to 30 students. In these classes he normally he sits at the back of the room and rarely, if ever, speaks to the instructor or other students. He said he felt comfortable participating with the smaller group in the distance learning class. With encouragement from the other students he often spoke on camera. Students at the site with the largest enrollment--13 students-- did not report the same feeling of closeness with other students.

Epilogue. At the end of the semester Dr. Kern said that she is still excited about distance learning. She felt that it is worthwhile, especially for the population she needs to reach--teachers in Appalachia.

> Teaching via compressed video is very demanding--both in time and in effort. I think that it is worth the investment for the teachers that we need to reach in Eastern Kentucky. One of the problems in education is that once teachers are out in the schools, they shut their classroom doors and are isolated from their peers. This problem is compounded here in rural Kentucky. There are no major highways connecting many of the areas and weather conditions--snow in the mountains in the winter and heavy spring rains--further complicate the problem. Distance Education via compressed video is one medium that can bring teachers together. I've always felt that the strength of this class is not what they gain from me, but what they gain for one another.

A student survey at the conclusion of the course indicated that students were generally pleased with their experiences in distance learning and Science 690. Everyone indicated that they would take another distance learning class and all but one student would recommend taking Science 690 via distance learning. The primary reasons students gave for indicating that they would take a future distance learning course were (in rank order):

1. The courses are closer to home/work and require less travel. Courses that were previously unavailable are now accessible.
2. Students enjoyed working with other students in smaller groups at the distance learning sites.
3. The courses provided an opportunity to learn new technologies.
4. The students have an opportunity to share/learn from other students (teachers) at different locations.
5. Students felt they were more actively involved in their own learning and therefore, learned more.

When students were asked what they valued most about Science 690, they were evenly divided between the hands-on science activities and the use of technology. Only three students ranked class discussions as being the most valuable aspect of the course. The distance learning feature they most liked was sharing with the teachers (students) at other sites. This answer ranked above the convenience of taking a course close to home/work or taking a course normally unavailable.

> I like the idea that I get to see the people from the other sites. I think that it is wonderful that so many of us can be reached through distance learning.

> It is fun to speak to students at other sites. I feel that we are all together, not in a variety of locations.

The least valued features or *things* they would like to change about Science 690 were not associated with the distance learning aspect of the course. They were divided among the readings, the textbook, the lab workbook, lab reports, and the number of course evaluations (Besides the journal writings and surveys for this study, the Distance Education Office required the students to complete two surveys and all students complete a standardized course evaluation for all courses at the end of the semester.) Although students stated early in the semester that the one distance learning feature they did not like was being on camera, at the end of the semester only four students listed this aspect as a problem. Thirteen students listed technology problems, especially sound quality (There existed a persistant problem with one public school site throughout the semester.) as a major problem with distance learning. Other concerns listed (in order) included: watching other sites give presentations, the amount of time wasted while setting up student presentations, not enough courses offered through distance learning and less teacher contact. The number of students expressing concern about the amount of teacher-student contact declined as the semester progressed. Students who actively used e-mail to send assignments and correspond with the instructor indicated to Dr. Kern that they felt they had more interaction and feedback on their assignments than in traditional classes.

Conclusion

Distance learning is a vehicle for reaching students isolated from traditional post-secondary education by distance, geographical barriers, or life circumstances. It is more than a convenience for students in our service region. It is a necessity. Courses that normally are inaccessible to the Appalachian population are now within reach.

Distance learning at Morehead State University is currently in its third year. Since Spring 1997, when data was collected for this study, facilities have been expanded and many improvements have been made in technology, communications, support and training of faculty and support staff.

This particular study followed a professor and a group of elementary teachers enrolled in a graduate level science education course. The subjects selected are a group of professionals who are charged daily with taking control and directing learning situations. At each site students--usually teachers with classroom experience--emerged as leaders. Therefore, the results of this study are not generalizable to other distance learning populations, especially undergraduates.

All students felt that the educational experience was enriched by their involvement with technology and collaborating with teachers from different locations.

> I feel I've learned just as much material and actually gained more teaching ideas than I would have in a traditional class setting by listening to and watching the presentations of other teachers from so many different places. The class has made me become a more independent learner-a goal I strive to have my own students achieve, it has made me become a better listener and helped make me more responsible for my learning

> ...one of my favorite things about distance learning is having the opportunity to use the internet and e-mail. I enjoyed the assignment where we used the internet and then used e-mail to report our findings.

Distance learning is not without its problems. It is very easy to get "caught up" in the technology with the result being that it drives the class. Too much time can be taken away from course content teaching students how to use equipment and software packages. This problem can be alleviated through separate workshops and help sessions supported or sponsored by the college or university. When planning the instruction the professor needs to first set his/her content goals and then determine how the technology can help him/her achieve that result.

As with any job involving equipment there is always the possibility of a technology failure. The likelihood of such an occurrence diminishes with the quality of the equipment. The problems associated with the system have mainly occurred at sites which have economized by purchasing less expensive microphones, monitors and cameras. But even with quality the unthinkable can happen. Therefore, it is essential to have a back-up plan and an alternate lesson that the site facilitators can deliver to the students.

In a learning situation where the instructor is not physically present, it is easy for both the students and the instructor to feel isolated from the other. This problem can be alleviated by the use of the *Nicenet* network, *Course Information* system, and other internet and software programs that have class conferencing, discussion groups and/or virtual chat room features along with the use of e-mail.

The delivery of materials to and from the remote sites is also a problem that must be considered before planning a distance learning class. The delivery system available- United States Postal Service, United Parcel Service or Courier-will have a direct effect on the activities you can do in class, the work assigned (e.g., portfolios, resource notebooks) and the due dates.

Looking at Distance Learning

Distance learning is not easy. It involves much hard work and commitment on the part of the instructor, students who are willing to give it a chance, and a support system from the post-secondary institution. Teaching from a distance is challenging but it also has its rewards, as evidenced by the following journal entry of a student.

> The technology in our schools for teachers and staff is very limited. So using the distance learning facility was quite a challenge. Since beginning the distance learning class my team teachers and I have pushed our school to get us on line and up to par with the rest of the world. We now have e-mail available... E-mail and the internet have opened a variety of services and facilities for us. I have acquired dozens of lesson plans and internet addresses to use. I now use research from the internet with my students.

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